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ABSTRACT

A study was conducted to compare the psychometric qualities of two identical forms of a survey administered in paper-and-pencil format and in Web format to 197 teachers randomly split into two paper and Web groups. While the rates of response were quite discrepant, the respective measures of reliability were extremely similar for the two versions of the survey. A followup study was conducted with the nonrespondents in the Web group to investigate reasons behind their decision not to complete the survey. Several methodological issues are raised as a result of the followup. (Contains 3 tables and 16 references.) (SLD)

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WHAT...ANOTHER SURVEY???
PATTERNS OF RESPONSE AND NONRESPONSE FROM TEACHERS TO TRADITIONAL AND WEB SURVEYS

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Abstract

This paper discusses the results of a study comparing the psychometric qualities of two forms of an identical survey: one administered in paper-and-pencil format and the other administered in Web format. Two groups of teachers were surveyed. One group received a paper-and-pencil version of the survey; the other group was directed to a Web-based version of the survey. While the rates of response were quite discrepant, the respective measures of reliability were extremely similar for the two versions of the survey. A follow-up survey was conducted with the nonrespondents in the Web group in order to investigate reasons behind their decision not to complete the survey. Several methodological issues are raised as a result of the follow-up.

WHAT...ANOTHER SURVEY???
PATTERNS OF RESPONSE AND NONRESPONSE FROM TEACHERS TO TRADITIONAL AND WEB SURVEYS

Background

The Internet has had a substantial impact on the field of survey research (Shannon, Johnson, Searcy, & Lott, 2001). This is evidenced by the growing number of electronically administered surveys over the past several years. Web surveys—which Dillman (1998) has referred to as one type of "self-administered" survey—are an extremely promising method of data collection (Schillewaert, Langerak, & Duhamel, 1998).

Discussed in this background review of related literature are specific works related to (1) advantages and limitations of Web-based survey methodology, (2) methodological issues related to Web-based survey methodology, (3) psychometric qualities (i.e., response patterns) of Web-based versus traditionally administered surveys, and (4) patterns of nonresponse in Web-based surveys.

Advantages and Limitations of Web-based Survey Methodology

Advantages of Web surveys include a high rate of response, short time frame for the collection of responses, and time and cost savings. The Web certainly addresses the need for a less expensive and more expedient method of data collection (Solomon, 2001; Heflich & Rice, 1999; Schillewaert et al., 1998). Furthermore, several additional benefits of using the Web for data collection have been identified (Carbonaro & Bainbridge, 2000; Mertler, 2001, 2002a, 2002b; Schillewaert et al., 1998; Shannon et al., 2001).

These benefits include a faster response, protection against the loss of data, easy transfer of data into a database for analysis, cost savings, convenience for the respondent, the possibility of wider geographic coverage, and a potentially better response rate—although this "advantage" is not uniformly agreed upon by the community of survey researchers (Matz, 1999).

However, it is important to note, as with any method of data collection, there also exist disadvantages. These include the potentially nonrandom nature of the sample, unavailability of population lists, computer access to the survey, and various technology-related issues. Additional limitations include the inability to clearly define the population, lack of technological familiarity on the part of respondents or their willingness to use a computer to complete the survey, the potential for being able to identify respondents, and browser incompatibility problems (Solomon, 2001; Carbonaro & Bainbridge, 2000; Schillewaert et al., 1998; Shannon et al., 2001).

One of the most substantial concerns about Web surveys is the potential nonrandom nature of the respondent group (Mertler, 2001, 2002a, 2002b; Solomon, 2001; Witte et al., 2000). However, the issue of nonrandomness is not unique to Web-based survey research and can be addressed through the maintenance of an accurate list of population members, when feasible. Survey research professionals have suggested that Web surveys be used primarily with specifically identifiable samples such as "in-house" employee groups (Shannon et al., 2001). Alternatively, Taylor (2000) has suggested that we remember that online data collection is not based on probability sampling, but rather on "volunteer" or "convenience" sampling.

Methodological Issues Related to Web-based Survey Methodology

Beyond the strengths and weaknesses of this methodology, Carbonaro and Bainbridge (2000) have outlined several other issues with which researchers should be concerned. First, access to the survey must be as simple as possible for all respondents. The more complex the process of completing the survey, the lower the resultant response rate will undoubtedly be. Second, the process must be designed such that respondents of the Web survey are able to complete it with the same relative ease as if they had received a traditional paper version. Third, some sort of security system is required, in order to maintain the integrity of the data, but also to put at ease the mind of the respondent. Finally, completion of the survey must require only minimal computer skills—including the ability to use an Internet browser, enter a specific URL, use a mouse, and type on a word processor. Matz (1999) and Shannon et al. (2001) also point out that a Web survey must somehow be publicized. Some mechanism must be used to direct potential respondents to the actual URL containing the survey, either by providing a link to the URL in an email message or by providing the URL in a cover letter.

Psychometric Qualities of Web-based Versus Traditionally Administered Surveys

Although more and more studies comparing the effectiveness of electronic and mail surveys are being conducted, there exists somewhat of a void in the research literature on this topic (Underwood, Kim, & Matier, 2000). Often, the results of Web-based surveys differ when compared to written questionnaires and telephone surveys (Taylor, 2000), although Saphore (1999) found that there were no differences in the pattern of responses between a Web survey and an identical pencil-paper form of the same survey.

Furthermore, he concluded that there were no differences in the psychometric qualities of the two forms of the survey.

In another comparison-type study, Matz (1999) compared the responses received from a Web survey with those received from a traditional paper-and-pencil survey. She found no significant differences between the demographic characteristics—such as age and gender—of the respondents completing the Web survey and those completing a mailed, written survey. Additionally, she found no significant differences between the content or pattern of responses for either group. The only significant finding—albeit, a substantial one—was that the overall response rate for the paper survey (43%) was significantly higher than that for the Web survey group (33%). Following his review of the literature, Solomon (2001) found this to be a consistent finding for studies which compared Web and mail surveys. A final result discussed by Matz (1999) was that the paper instrument seemed to provide more flexibility to the respondents. They could freely make comments about items they did not understand or felt were ambiguous. In spite of these last two findings, she concluded that Web surveys seemed to be a reasonable alternative—or, at least, equally suspect—to mail surveys.

Another example of research comparing the psychometric characteristics of these two survey methodologies was conducted by Mertler and Earley (2003). The researchers concluded that Web-based and traditional survey methodologies result in similar sets of psychometric qualities based on comparable obtained values for internal consistency reliability. Although not identical, the patterns of responses—as identified by contributions to the overall scale—across the two modes of delivery were also fairly comparable.

In a final example, Idleman's (2003) results contradicted those of Mertler and Earley (2003), with respect to the similarity of internal consistency values. Idleman (2003) observed that entire mail surveys, as well as subscales within those surveys, exhibited higher reliability coefficients that those resulting from a Web-based version of the same survey, although the coefficients were well within the acceptable range for both modes of delivery.

Patterns of Nonresponse in Web-based Surveys

A viable and important source of error in surveys is nonresponse (Montez, 2003). The reason for this is that the characteristics of nonrespondents may somehow differ from those of respondents, potentially limiting the external validity of the survey's results (Montez, 2003).

Solomon (2001) notes that some potential respondents have difficulty with the technology and give up early in the process of completing a Web-based survey, or when encountering complex questions. Others may often be reluctant to give out personal information, such as an email address.

In her study of nonresponse, Montez (2003) received 55 (25%) follow-up responses from 218 original *non*respondents. In analyzing the reasons given for nonresponse, five categories emerged. The five categories were:

- simple, but polite, refusal to participate;
- not enough time to participate;
- change in professional position (therefore, the topic of the survey was no longer appropriate);

- desire to only respond to surveys that are prepared as part of the business of national organizations; and
- belief that the survey was poorly designed or did not truly capture the desired topic.

Summary

Because of the technological skills required to develop and implement Web-based surveys, the driving force behind their use has *not* been survey professionals, but rather technology specialists (or at least someone with a background in technology) (Dillman & Bowker, 2001; Shannon et al., 2001). In order to harness the potential for using the Internet for the collection of valid and reliable data, those most knowledgeable about survey research methodology—specifically with respect to causes and consequences of survey error (Dillman & Bowker, 2001)—must take an active role in its development as a viable methodology for data collection. Specifically, research is needed in order to compare responses from Web surveys and those conducted in more traditional manners (Dillman & Bowker, 2001).

Purpose of the Study

The primary purpose of this study was to add to the knowledge base regarding the use of Web-based surveys as a viable means of collecting data for educational research. Specifically, the researchers investigated and compared the relative effectiveness, psychometric qualities, and response patterns of two versions of the same survey: one delivered as a Web-based survey and the other as a paper survey. A secondary purpose was to assess the patterns of nonresponse, particularly with respect to the Web version of the survey.

The research questions addressed in the study were:

Research Question 1: What are the psychometric qualities (i.e., response patterns) for survey data resulting from traditional and Web-based delivery modes? How do the two sets of qualities compare?

Research Question 2: What patterns of survey nonresponse result from the administration of the same survey?

Methods

Participants

During the fall of 2002, the researcher surveyed inservice teachers with respect to their assessment literacy. The group of inservice teachers consisted of 197 teachers, representing nearly every district in a three-county area surrounding the researcher's institution. The schools were selected based on convenience due to their geographic location. All grade levels and content were represented in the final sample. The teachers were randomly split into two groups: one group received a paper-and-pencil version of the survey; the other group was directed to a Web-based version of the survey.

Instrumentation

Both groups of teachers were originally surveyed using an instrument titled the *Classroom Assessment Literacy Inventory*, or *CALI*, which was adapted from a similar instrument called the *Teacher Assessment Literacy Questionnaire* (Plake, 1993; Plake, Impara, & Fager, 1993). This inventory is based on the *Standards for Teacher Competence in the Educational Assessment of Students* (AFT, NCME, & NEA, 1990). The *CALI* consisted of the same 35 content-based items (five per standard) with a limited

amount of rewording (e.g., changing some names of fictitious teachers, changing word choice to improve clarity, etc.), as well as 7 demographic items.

The original instrument has been shown to have reasonable reliability with inservice teachers, $r_{KR-20} = .54$ (Plake, Impara, & Fager, 1993). Additionally, the original instrument was subjected to a thorough content validation, including reviews by members of the National Council on Measurement in Education and a pilot study with and feedback from practicing teachers and administrators.

Procedures

The paper-and-pencil group received the cover letter and survey directly through U.S. Mail and was supplied with a postage-paid return envelope. The Web-based group received an email message containing the cover "letter" and a link consisting of the URL to the survey. Two weeks after the initial mailing of the paper version and posting of the Web-based version, teachers were sent a reminder about completing the instrument.

Due to the low rate of response to the Web version of the survey, a follow-up "survey" was conducted via email for the group of nonrespondents. This email survey consisted of the following:

I received a very poor response to my recent Web survey titled the ***Classroom Assessment Literacy Inventory***. I am attempting find out why the response was so low.

If you did not complete the survey, please take 30 seconds to reply to this email message and indicate which of the reasons listed below was the main reason you did not complete the survey. You can do so by simply typing an "X" next to you response. If you select "Other," please provide a brief explanation.

( ) The topic didn't interest me.
( ) I couldn't access the survey due to limitations of technology.
( ) I was afraid of the security/confidentiality of my responses.
( ) I couldn't access the survey due to my lack of technological expertise.
( ) I simply didn't want to take the time to respond.
( ) The survey was too lengthy.
( ) Other (please explain)

Thank you very much!!!
Craig A. Mertler, Ph.D.

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Analyses

For the two modes of survey delivery, statistical analyses included the computation of internal consistency (i.e., coefficient alpha) reliability coefficients and individual item analyses. All statistical analyses were conducted using SPSS (v. 11). Content analyses were also conducted for the teacher-supplied reasons for nonresponse in an attempt to classify them into thematic categories.

Results

The results that follow are presented by each individual research question.

Research Question 1: What are the psychometric qualities (i.e., response patterns) for survey data resulting from traditional and Web-based delivery modes? How do the two sets of qualities compare?

Although the data resulting from the administration of the two surveys were analyzed for the entire group, the analyses were primarily based on "formal" (i.e., statistical) techniques followed by "informal" (i.e., nonstatistical) comparisons of the results by the two subgroups—namely, the data resulting from the traditional paper-and-pencil method of delivery ($N = 142$) and those resulting from the Web form of the survey ($N = 55$). The return rate for the total survey was equal to 17%; the return rate for the paper-and-pencil administration was equal to 21%, while that for the Web administration was equal to 11%.

Analysis of the overall scale comprised of 35 items for the entire group ($N = 197$) revealed an internal consistency measure (i.e., Cronbach's index of internal consistency; also known as the alpha coefficient, or α) equal to .57, indicating a moderate degree of

reliability. The internal consistency measure for the "paper" sample (α = .56) was nearly identical to that for the "Web" sample (α = .59).

The resulting data were also analyzed at the level of the individual items. Specifically, the internal consistency of the overall scale with each individual item removed was determined. This is typically done in order to assess the contributions of individual items to the total scale. The resulting analysis reports an alpha (α) coefficient for the total scale *minus* the particular item. A "new" α coefficient (i.e., for the 34-item scale) that is *lower* than that for the 35-item scale indicates that the particular item did in fact contribute positively to the total scale; in other words, when the item was removed, the overall reliability decreased. In contrast, a "new" α coefficient that is *higher* than that for the original scale indicates that the particular item did not contribute to the overall scale; in other words, when the item was removed, the overall reliability improved.

Of the 35 items appearing on the survey administered in a traditional manner (i.e., paper-and-pencil), analyses of 6 items revealed improved internal consistency values when they were individually removed from the scale. The results of the individual item analyses for the survey administered via the Web were somewhat similar. Of the 35 items, 10 showed improved internal consistencies when removed from the scale. A summary of the analyses of these individual items and the amounts of improvement in overall scale reliabilities are presented in Table 1 and Table 2, respectively. Furthermore, it is important to note that, upon *informal* comparison of the list of 6 items identified from the paper-and-pencil method and the 10 items identified from the Web delivery method, 4 items were common to both lists.

Insert Table 1 here

Insert Table 2 here

Research Question 2: What patterns of survey nonresponse result from the administration of the same survey?

A potentially more interesting set of findings resulted from the originally unintended follow-up survey conducted with those teachers in the Web group who chose not to complete the survey of primary interest in this study. These teachers ($N = 457$) were emailed and asked to indicate from seven options the main reason they did not respond to the survey. Ninety-four teachers, representing 21% of the nonrespondent group responded to the follow-up (interestingly, this was nearly twice the number that responded to the original survey). The frequencies of response to the seven options are presented in Table 3. The teachers were instructed to explain their response if they marked option #7 ("Other"). However, many teachers provided additional comments, regardless of the option they selected.

Insert Table 3 here

The most common reason for nonresponse to the original survey was "I simply didn't want to take the time to respond," with over one-third (37%) of nonrespondents

indicating that this was their reason. Examples of open-ended comments that fit into this category included the following:

> *I didn't have the time, no matter how short or long.*
>
> *I simply do not have the time to do this at this time. I could maybe do it this summer.*
>
> *My day is packed FULL with virtually no time to spare. It's not that I didn't WANT to take the time... other necessary tasks had absolute priority on my time... and if you have ever taught a core high school subject for any length of time, you'd know that.*
>
> *I started doing the survey and it was taking longer that I cared to spend doing the survey. I stopped doing the survey after about 3–4 questions.*

A considerable number of teachers (16%) also indicated that they did not respond due to technological limitations (e.g., couldn't access the survey, lack of technological expertise, etc.). Examples of open-ended comments that were categorized here included the following:

> *I am sorry I didn't reply, but I am not able to open the survey.*
>
> *I couldn't reply. You had a link to click on and nothing happened when I clicked on it. Also, I couldn't put an X in the spot you asked me to on this email.*
>
> *I didn't fill out the survey because the hyperlink did not connect me. I didn't want to take the time to fill in the address.*
>
> *Can't access the survey or type an "X" in the appropriate answer below.*
>
> *Our set-up at [our school] is VERY limited. We cannot open the document – I tried, but the computer would not allow this to happen.*
>
> *I did not respond to you survey because I could not get into your site.*
>
> *I was unable to respond to your survey because of poor school equipment.*

Began answering the questions. When my planning period was over, I stopped answering. When I came back the next day, none of my answers had been saved. I simply do not have the time to spend two planning periods answering a survey.

... I am the tech rep for my building... three other teachers in the building sought my help – two of them had the same trouble I did – it disappeared without sending upon completion. The third teacher responded to approximately 1/2 and attempted to save her responses so she could complete it at another date. When she went back to it, all of her answers were gone.

Fourteen teachers (15%) indicated that the survey was simply too long to respond to. Many of those who checked this option also checked the option stating that they did not want to take the time to respond.

Finally, twenty-four teachers (26%) checked "Other." These teachers offered a variety of explanations for their selection. These explanations included the following as examples:

I chose not to answer your survey due to confidentiality reasons. There was no way to respond without being identified.

Everyone gets tons of junkmail. I delete everything that is not from someone I know.

I deleted the message accidentally and don't know where the survey is.

As a kindergarten teacher, I do not do much to assess literacy.

This was not in my area of expertise.

Discussion

Research has begun to demonstrate that utilizing a Web-based approach is a viable means of gathering survey data. However, further research must be conducted on this mode of delivery in order to pass judgment on its relative merits. There are several

advantages to electronic surveys, in general. These include such things as cost and timesavings, as well as the ease of transfer of responses into a database. Are these advantages over paper-and-pencil surveys great enough to "counteract" the problems associated with nonrandom samples? Are potential respondents comfortable enough with technology to respond to surveys online? Or do they remain apprehensive about potentially realistic concerns such as anonymity, confidentiality, and security of their provided information? If the answer to the latter question is "yes"—which certainly seemed to be the case in the present study—do we as researchers end up with a "differential" type of random sample resulting from respondent self-selection? This, of course, is a concern for any type of survey research, but can we be sure that we are not ending up with a sample whose characteristics are different from those realized through paper-and-pencil forms of surveys? To address these and related issues, further research is most certainly called for.

A few interesting methodological issues related to the Web-based mode of survey delivery were raised as a result of this study. First, the researcher, working in consultation with an information technology professional at the institution, checked the viability of the Web-based survey on a variety of Web browsers (e.g., Internet Explorer, Netscape Navigator, and others), as well as various versions of those browsers. Although these various combinations of browsers and versions were verified, some teachers still were unable to access the survey, as evidenced by their comments in response to the follow-up survey. This may have been due—at least in part—to older hardware and/or software in the schools.

Second, it is important to note that many of the teachers surveyed in this study worked in rural school settings. Many of those districts contract with private Internet service providers (ISPs) to provide Internet access and email services. Another possible cause for teachers' inabilities to access the survey may have been caused by the various settings provided by the ISPs who supply service to these districts. Following the initial email message (i.e., cover letter) for the primary survey, several teachers corresponded with the researcher to inform him that their district did not support hyperlinks embedded in email messages. In some instances, the URL appeared in the message, and when teachers clicked on it, nothing happened (of course, this is easily remedied by copying and pasting the link into the URL bar of a browser window). In other situations, the URL did not even appear in the body of the email message. Still other teachers informed the researcher that their district did not permit delivery of email messages from unknown sources or access to unknown URLs. It is possible then that for some teachers access to the survey was *literally impossible* (and, therefore, not a conscience decision made on the part of individual teachers), or that some of them *never* even received the email cover letter. Obviously, this would have had a substantial impact on the ultimate rate of response to the survey.

Third, and somewhat related to the second issue above, involves the issue of technology literacy. Although we have a tendency to believe that everyone—especially in the educational community—in this day and age is technologically literate (e.g., knows all about browsers, how to maneuver around the World Wide Web, how to alter email settings, etc.), the fact remains that many individuals, especially teachers, are simply not literate in this sense. Many teachers, when encountered with a hyperlink that did not

"work," were apparently unaware that the URL could be copied and pasted into a browser window; they simply gave up and did not try further to access the survey. Also troublesome to the researcher was the fact that some teachers began to respond to the survey, logged off of their computers, logged back onto them the next day, and expected to gain access to their partially completed survey, ready to finish and submit. Most—if not all—Web pages do not work this way.

As further evidence of this phenomenon of technology *il*-literacy, witness the following brief email conversation held with one of the nonresponding teachers as a result of the follow-up survey, who clearly did not know what a Web browser even was:

Teacher: *I have been unable to access your literacy survey. I have tried several times, but it doesn't seem to want to come up on my computer.*

Researcher: *What type of Web browser are you using? Do you know the version number?*

Teacher: *No clue! I'm on [private computer service provider]. Does that help you?*

Generally speaking, further research on the feasibility of the Web-based delivery of surveys is most certainly warranted. In addition, as a result of this study, other vitally important methodological issues have had some light shed upon them. The issue of equal access to Web-based surveys—and to electronic surveys, in general—as well as the issue of the technological capabilities of potential respondents truly calls into question the extent to which educators, especially in K–12 settings, should be surveyed via electronic means. At this point in time, if the educational research community continues to do so, we can only assume that we are, in all probability, obtaining anything but a representative sample.

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Table 1

Identified Items and Recalculated Reliabilities for Item Analysis of Data Resulting from Paper-and-pencil Survey

Survey Item Number	Alpha Coefficient (If Item Deleted) [a]	Amount of Change In Reliability
Item 5 [b]	.590	+.033
Item 10	.564	+.040
Item 13 [b]	.561	+.044
Item 21	.559	+.046
Item 22 [b]	.561	+.050
Item 31 [b]	.578	+.071

[a] Alpha coefficient of the total scale was equal to .557 (rounded to .56).

[b] These items were also identified following the item analysis of data resulting from the Web-administered survey.

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Table 2

Identified Items and Recalculated Reliabilities for Item Analysis of Data Resulting from Web Survey

Survey Item Number	Alpha Coefficient (If Item Deleted) [a]	Amount of Change In Reliability
Item 2	.598	+.005
Item 4	.598	+.005
Item 5 [b]	.610	+.022
Item 7	.594	+.023
Item 13 [b]	.604	+.034
Item 14	.613	+.020
Item 16	.597	+.024
Item 22 [b]	.597	+.004
Item 26	.609	+.016
Item 31 [b]	.604	+.011

[a] Alpha coefficient of the total scale was equal to .593 (rounded to .89).

[b] These items were also identified following the item analysis of data resulting from the paper-and-pencil-administered survey.

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Table 3

Frequencies and Percentages of Response for Follow-up Survey of Nonrespondents

Reason	Frequency of Response	Percentage of Response
The topic didn't interest me.	1	1%
I couldn't access the survey due to limitations of technology.	15	16%
I was afraid of the security/confidentiality of my responses.	4	4%
I couldn't access the survey due to my lack of technological expertise.	1	1%
I simply didn't want to take the time to respond.	35	37%
The survey was too lengthy.	14	15%
Other	24	26%

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